



ARSET

Applied Remote Sensing Training

<http://arset.gsfc.nasa.gov>

 @NASAARSET

Satellite Based Fire Products: Methods, Data Access, and Applications

Melanie Follette-Cook, Pawan Gupta, & Land Team

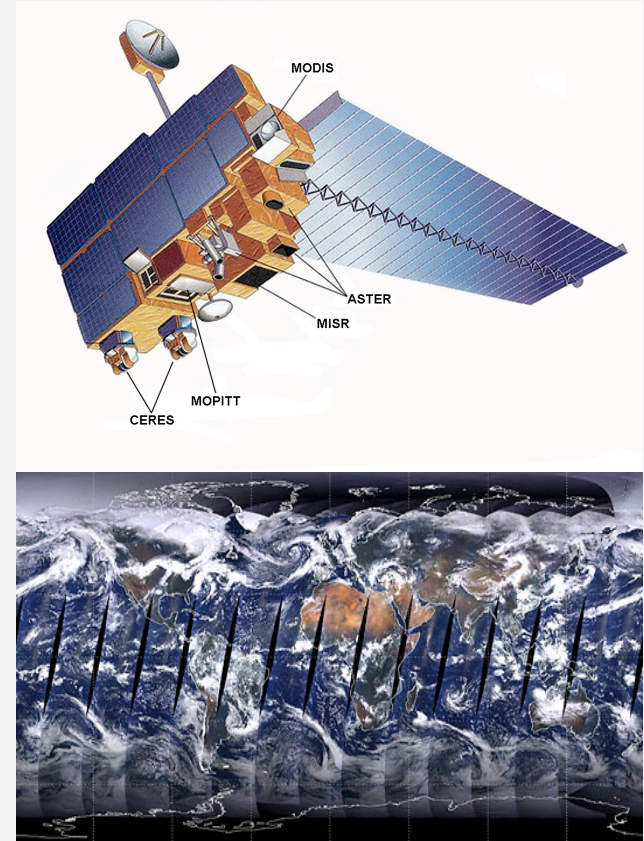
Satellite Remote Sensing of Air Quality

September 19-21, 2017

University of California, Riverside

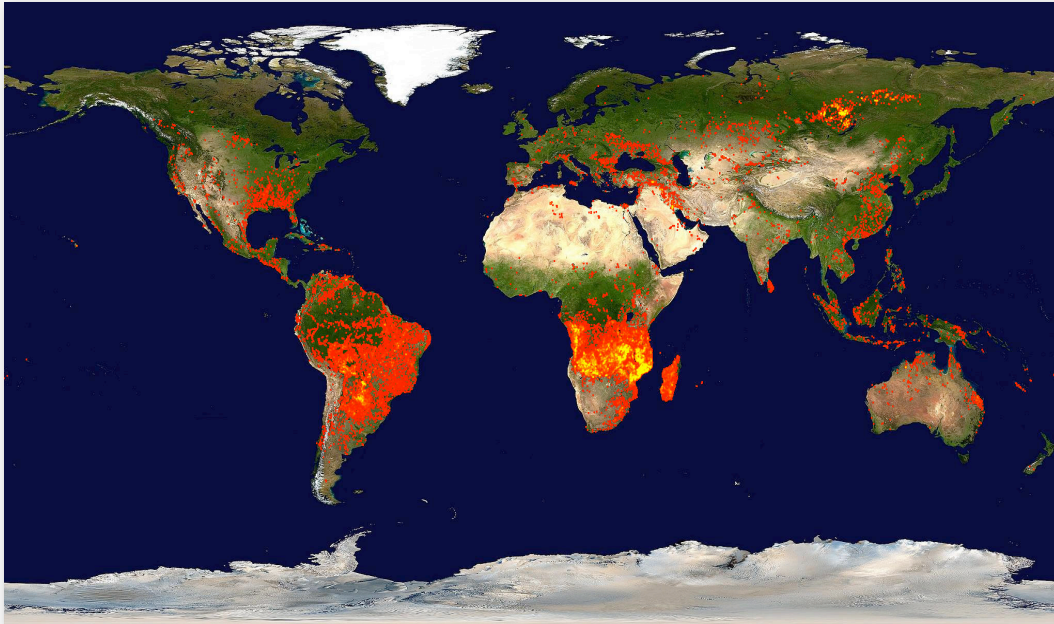
MODIS

- Spatial Resolution
 - 250 m, 500 m, 1 km
- Temporal Resolution
 - Daily, 8 day, 16 day, monthly, quarterly, yearly
 - 2000–present
- Data Format
 - Hierarchical data format – Earth Observing System Format (HDF–EO8)
- Spectral Coverage
 - 36 bands (major bands include red, blue, IR, NIR, MIR)
 - Bands 1-2: 250 m
 - Bands 3-7: 500 m
 - Bands 8-36: 1000 m



MODIS Fire Products

- Near Real-Time (NRT) thermal anomalies and fire locations
- Provides snapshots of active burning fires and burned areas
- The Active Fire product delivers actively burning locations on a daily basis at 1 km resolution (additional 8 day and monthly products)

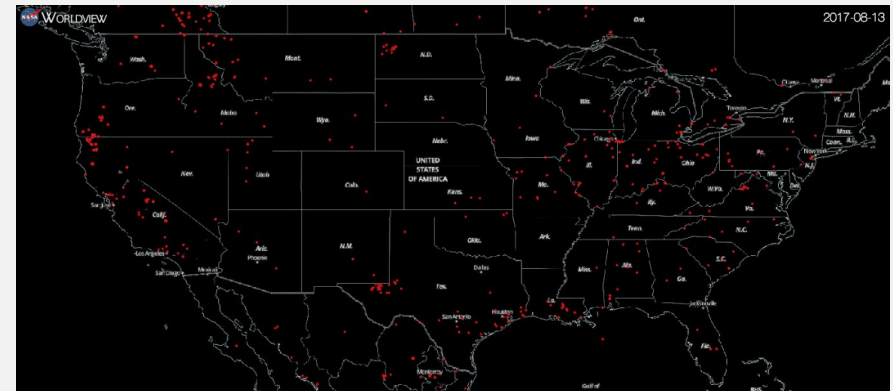


**Global Fire Map
(September 17 – 26, 2016)**

Colors range from red, where the fire count is low, to yellow where the number of fires is large

MODIS Thermal Anomalies Algorithm

- MODIS Fire Detection:
 - 1 km pixel flagged as containing one or more fires
 - can also detect volcanic signatures
- Significant increase in absolute radiance at 4 μm (band 22) and 11 μm (band 31)
 - cloud masks applied
 - VIIRS active fire detection algorithm is similar



VIIRS fire detections,
NASA Worldview

MODIS Fire Detection Algorithm

http://modis-fire.umd.edu/files/atbd_mod14.pdf

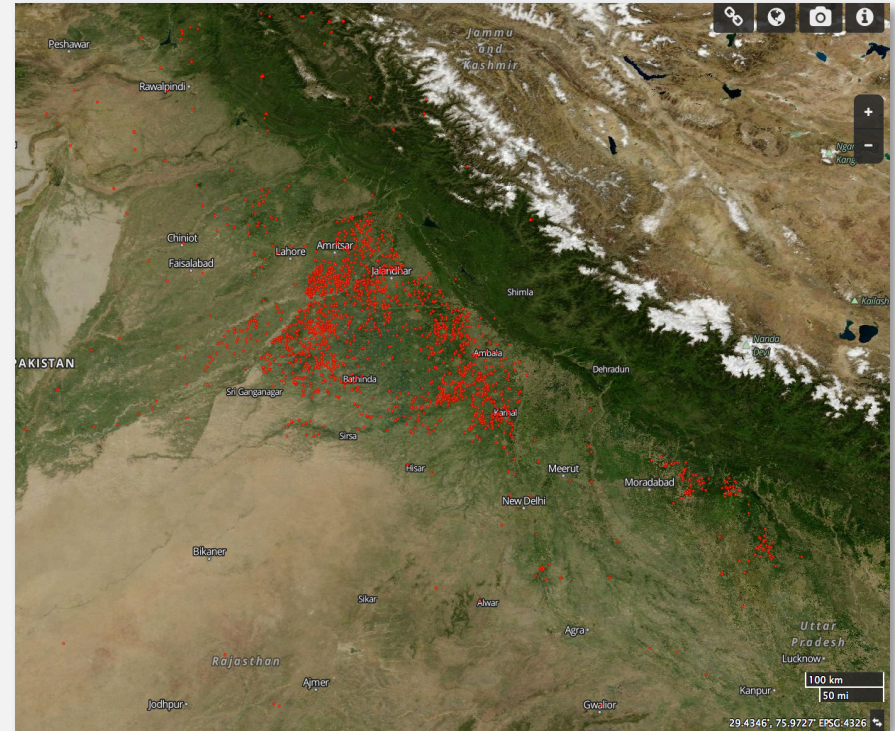
Table 2: MODIS channels used for active-fire detection and characterization.

Channel	Central wavelength (μm)	Purpose
1	0.65	Sun glint and coastal false alarm rejection; cloud masking.
2	0.86	Bright surface, sun glint, and coastal false alarm rejection; cloud masking.
7	2.1	Sun glint and coastal false alarm rejection.
21	3.96	High-range channel for fire detection and characterization.
22	3.96	Low-range channel for fire detection and characterization.
31	11.0	Fire detection, cloud masking.
32	12.0	Cloud masking.

- Potential fire pixel identified
 - $BT4 > 310 \text{ K}$
 - $BT4 - BT11 > 10 \text{ K}$
 - $0.86 \text{ reflectance} < 0.3$
- Otherwise flagged as non-fire pixel

MODIS Thermal Anomalies Algorithm

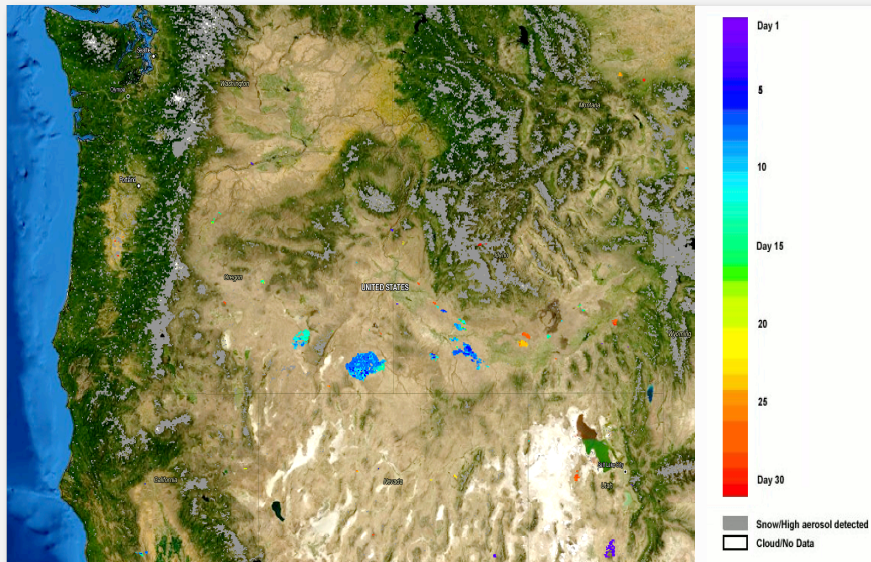
- Limitations
 - False positives: small forest clearings (bare soil)
 - Large fire omissions due to thick smoke
- Collection 6 (most recent) improves upon these errors
 - Global commission error of 1.2%



MODIS fire detections,
NASA Worldview

MODIS Land Products: Burned Area (MCD64A1)

- The combined Terra & Aqua MODIS Burned Area Product is a monthly gridded 500m product
- MODIS detects the approximate date of burning at 500m resolution
- Maps include the spatial extent of recent fires
- For more information: <http://modis-fire.umd.edu>



This image shows the extent of the Long Draw fire that occurred in southeastern Oregon. The colors represent the approximate day of the burning from July 8 (start of fire) to July 12, 2012 (end of fire).

Where to Obtain MODIS Products



Land Process Distributed Active Archive (LPDAAC) <http://lpdaac.usgs.gov/>



ECHO Reverb: <http://reverb.echo.nasa.gov>



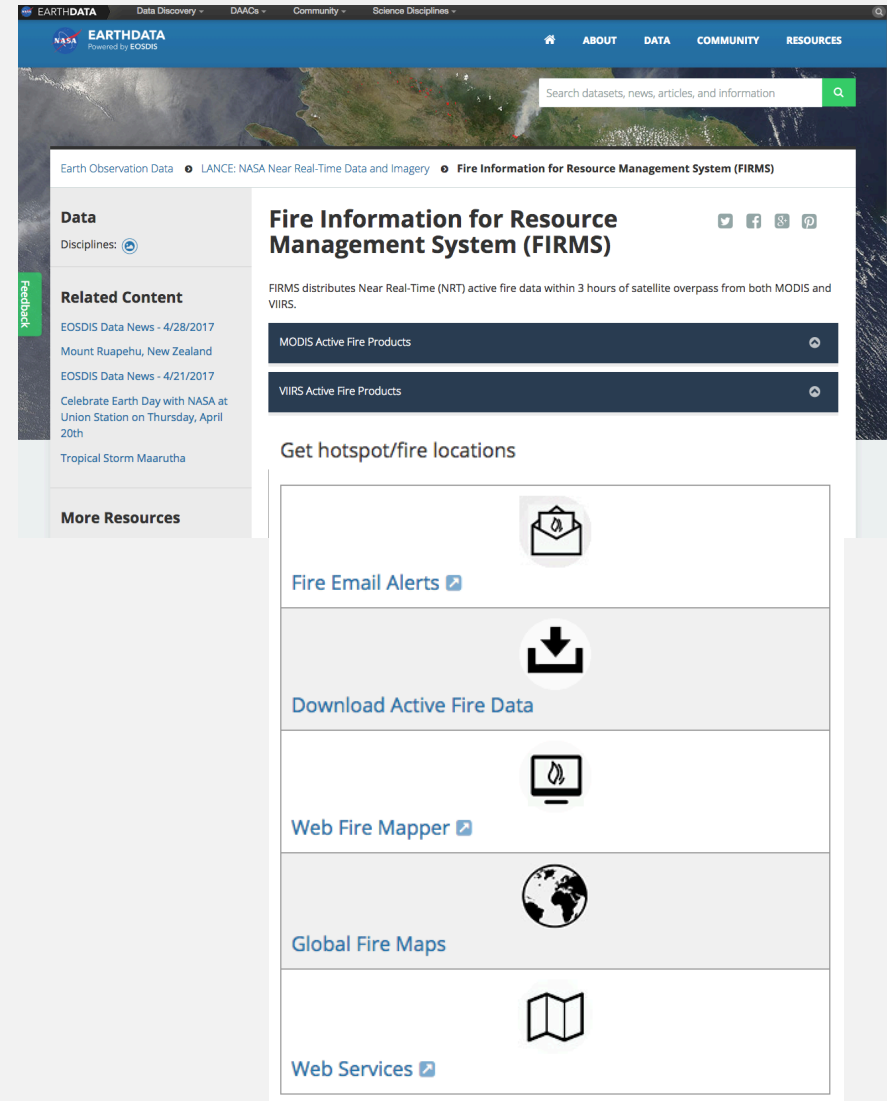
Worldview: <http://worldview.earthdata.nasa.gov>



Fire Information for Resource Management System: <http://earthdata.nasa.gov/earth-observation-data/near-real-time/firms>

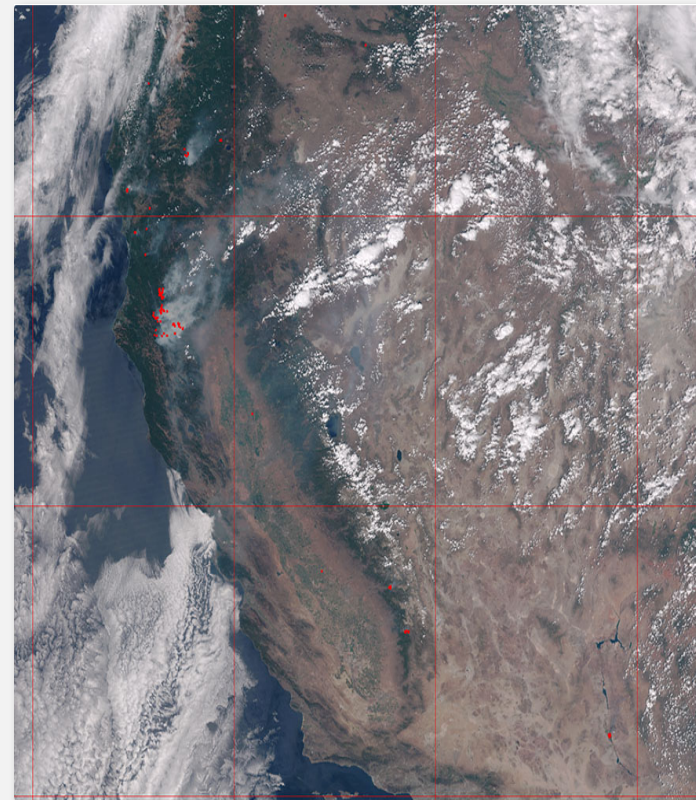
Fire Information for Resource Management System (FIRMS)

- Near real-time (NRT) active fire data within 3 hrs of satellite overpass
- Global MODIS and VIIRS hotspots, fire locations, and burned area images
- Historical data available
- Available in:
 - Email alerts
 - GIS-friendly file format
 - Visualization in **Web Fire Mapper** or **Worldview**



VIIRS Active Fire Product

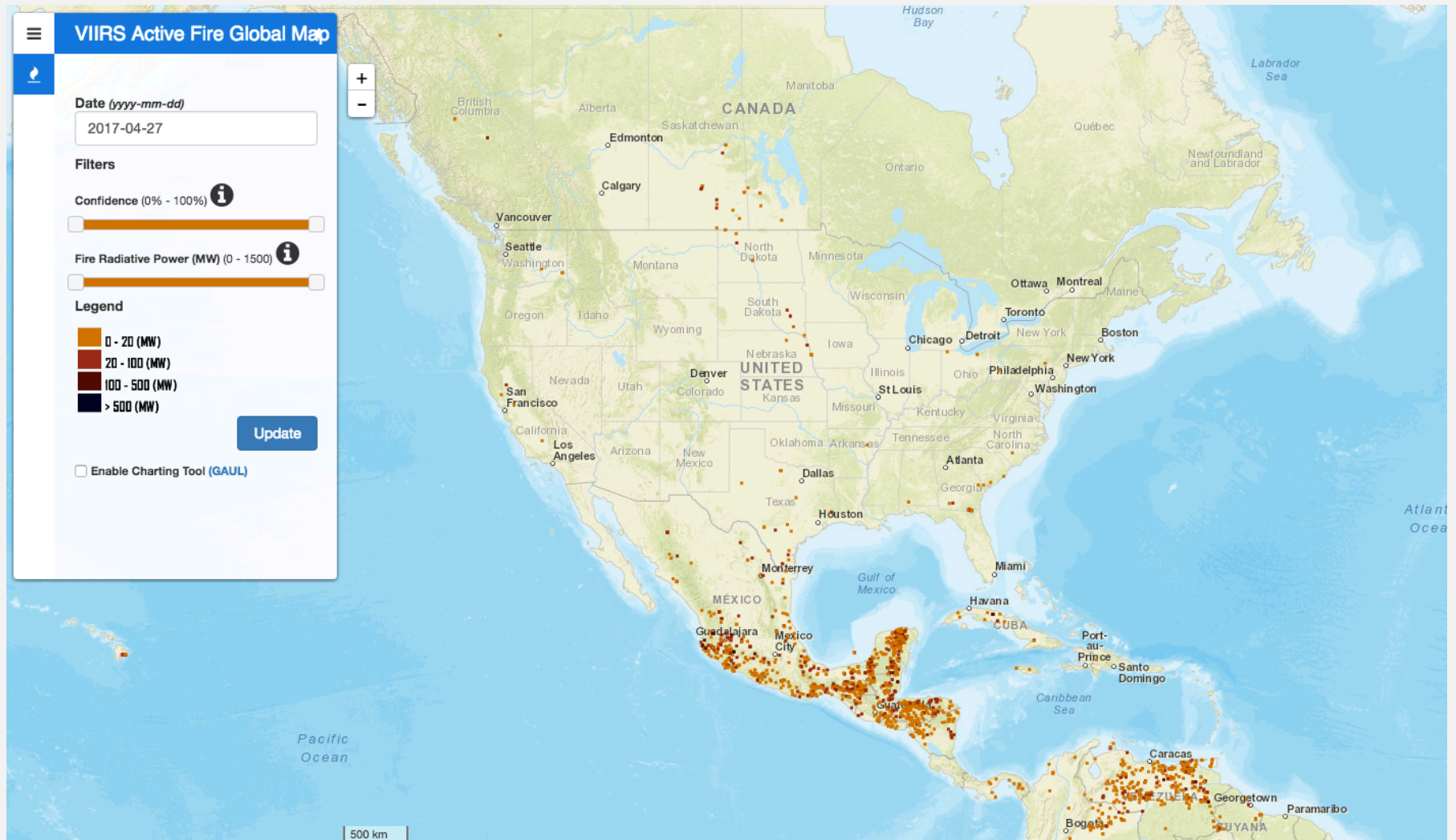
- Released October 22, 2012
- Spatial resolution:
 - 750 m (M-band)
 - 375 m (I-band)
- Data still preliminary and continually undergo evaluation & calibration
- Data available as:
 - ASCII
 - KMZ
 - TIFF
- Exercise on this tool in upcoming session



Northern California Fires,
2015

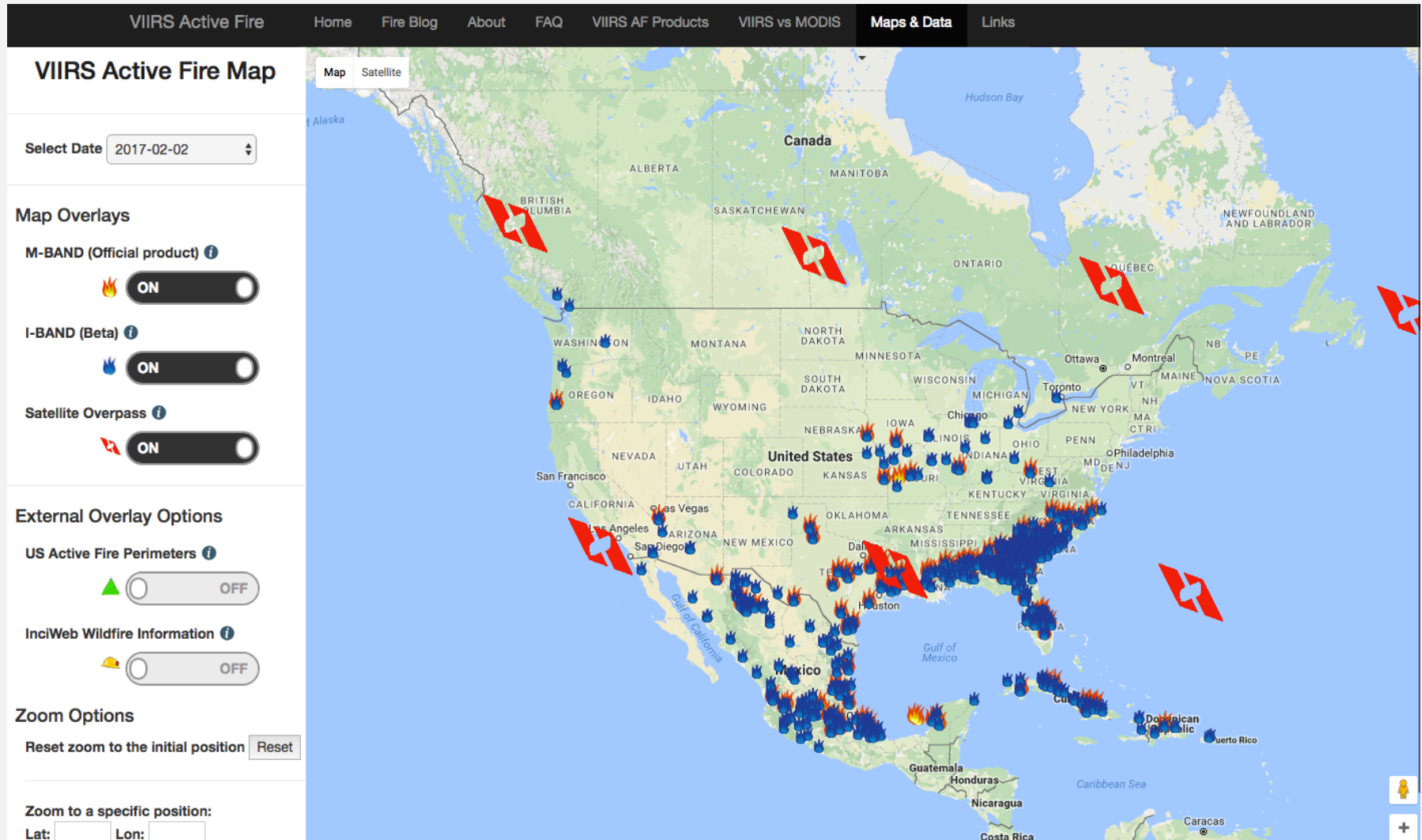
VIIRS Active Fire Map (CONUS)

<http://viirsfire.geog.umd.edu/map/viirsMap.php>



VIIRS Active Fire Map (CONUS)

http://viirsfire.geog.umd.edu/map/map_v2.php



US Forest Service - Tools

<https://fsapps.nwcg.gov/afm/>

USDA FOREST SERVICE

REMOTE SENSING APPLICATIONS CENTER

Fire Data in Google Earth

Current Large Incidents (Home)

New Large Incidents

Fire Detection Maps

MODIS Satellite Imagery

VIIRS Satellite Imagery

Fire Detection GIS Data

Fire Data in Google Earth

Fire Data Web Services

Latest Detected Fire Activity

Other MODIS Products

Frequently Asked Questions

About Active Fire Maps



MODIS

VIIRS

LANDSAT

AVHRR

GOES

Continental United States



KML

Fire Detections (MODIS): [Current](#) | [Animation](#) | [Historical](#)

Fire Radiative Power (MODIS): [Current](#) | [Animation](#) | [Historical](#)

Large Incidents: [Current](#) | [Historical](#)

Fire Weather: [Current](#)

AFM KML Bundle: [Current](#)

KML Access:

The links below provide access to several geospatial datasets relevant to fire management in Keyhole Markup Language (KML/KMZ) format for use in Google Earth and other virtual



Remote Sensing Applications Center

2222 West 2300 South

National Aeronautics and Space Administration

Applied Remote Sensing Training Program

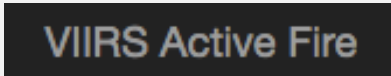
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Where to Obtain VIIRS Land Products



Worldview:

<http://worldview.earthdata.nasa.gov>



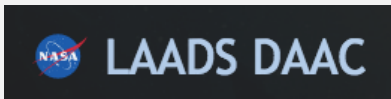
VIIRS Active Fire:

<http://viirsfire.geog.umd.edu/pages/about.php>



NOAA Comprehensive Large Array-Data Stewardship System (CLASS):

<http://www.class.ngdc.noaa.gov/saa/products/welcome>



Level-1 and Atmosphere Archive & Distribution System Website: <http://ladsweb.nascom.nasa.gov>

Questions & Discussion Prompts

- Changes in what retrieved quantity are used to detect fires?
- What is a source of uncertainty for fire detection?

A satellite image of the Red Sea region, showing the sea and surrounding landmasses. A semi-transparent rectangular box is overlaid on the image, covering the central part of the Red Sea and the surrounding land. Inside this box, the word "Questions" is written in a large, black, sans-serif font. Below the text, there is a horizontal black line. The background image shows the Red Sea with some red markings on the landmasses, possibly indicating specific locations or features of interest.

Questions
